MARUEEB

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Master Degree in
Innovative Technologies in Energy Efficient Buildings
for Russian & Armenian Universities and Stakeholders

Investments Valuation

Risk analysis ISO 31000 - Social ROI (S-ROI) Net Present Value (NPV) - Internal Rate of Return (IRR) - Payback Period (PBP)

Genoa, Italy. Lessons: October 11-12, 2016

UNIVERSITÀ DEGLI STUDI DI GENOVA

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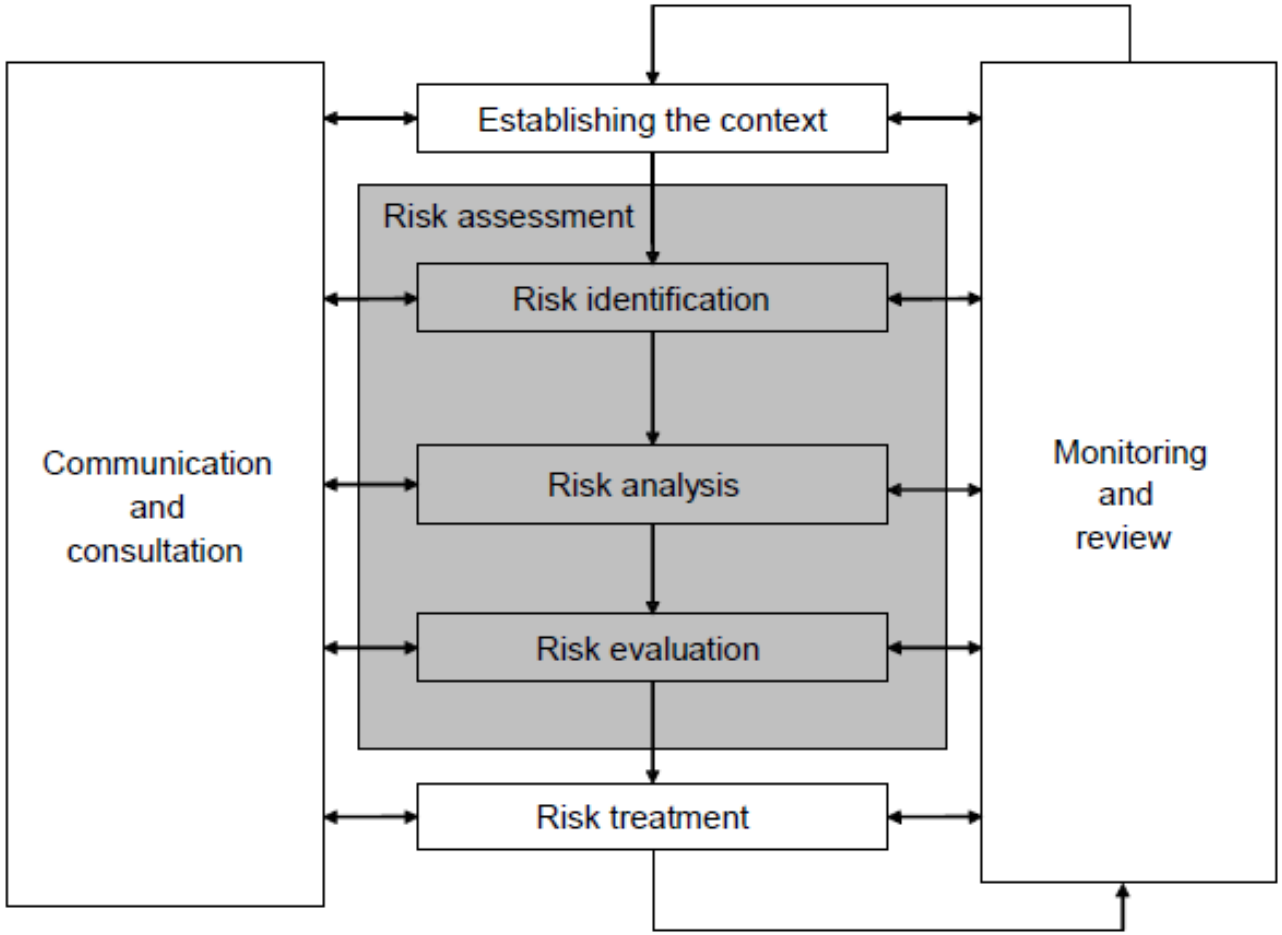
Risk assessment before evaluation (ISO 31000 standard)



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Risk analysis

- Risk analysis is about developing an understanding of the risk. It provides an input to risk assessment and to decisions about whether risks need to be treated and about the most appropriate treatment strategies and methods.
- Risk analysis consists of determining the consequences and their probabilities for identified risk events, taking into account the presence (or not) and the effectiveness of any existing controls. The consequences and their probabilities are then combined to determine a level of risk.
- Risk analysis involves consideration of the causes and sources of risk, their consequences and the probability that those consequences can occur. Factors that affect consequences and probability should be identified. An event can have multiple consequences and can affect multiple objectives. Existing risk controls and their effectiveness should be taken into account.
- Various methods for these analyses are described in Annex B. More than one technique may be required for complex applications.

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Risk identification

Risk identification is the process of finding, recognizing and recording risks.

- The purpose of risk identification is to identify what might happen or what situations might exist that might affect the achievement of the objectives of the system or organization. Once a risk is identified, the organization should identify any existing controls such as design features, people, processes and systems.
- The risk identification process includes identifying the causes and source of the risk (hazard in the context of physical harm), events, situations or circumstances which could have a material impact upon objectives and the nature of that impact

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Risk identification

Risk identification methods can include:

- evidence based methods, examples of which are check-lists and reviews of historical data;
- systematic team approaches where a team of experts follow a systematic process to identify risks by means of a structured set of prompts or questions;
- inductive reasoning techniques such as HAZOP.

Various supporting techniques can be used to improve accuracy and completeness in risk identification, including brainstorming, and Delphi methodology.

Irrespective of the actual techniques employed, it is important that due recognition is given to human and organizational factors when identifying risk. Hence, deviations of human and organizational factors from the expected should be included in the risk identification process as well as "hardware" or "software" events.

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Risk analysis and assessment

- Risk analysis normally includes an estimation of the range of potential consequences that might arise from an event, situation or circumstance, and their associated probabilities, in order to measure the level of risk. However in some instances, such as where the consequences are likely to be insignificant, or the probability is expected to be extremely low, a single parameter estimate may be sufficient for a decision to be made
- In some circumstances, a consequence can occur as a result of a range of different events or conditions, or where the specific event is not identified. In this case, the focus of risk assessment is on analysing the importance and vulnerability of components of the system with a view to defining treatments which relate to levels of protection or recovery strategies.
- Methods used in analysing risks can be qualitative, semi-quantitative or quantitative. The degree of detail required will depend upon the particular application, the availability of reliable data and the decision-making needs of the organization. Some methods and the degree of detail of the analysis may be prescribed by legislation.

The finance function in management

Objectives and tasks: a result of changes that occurred in the capital market, the financial markets and real estate markets.

Initially: management tasks to find financial sources on the capital market.

The need for financial resources is fundamental for example, in extraordinary operations, merger and acquisition (M & A), disposals and acquisitions and company contributions.

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Secondly the role of the financial function was addressed to the management of timing differences between receipts and payments (maturity matching), typical of each production process.

In addition to these main tasks, still considered today the basic function of finance, were added issues related to the effective use of these resources (Enlarged finance)

The management is increasingly attentive to short-term sources (equity, debt capital and debt) and to employment (cash and investments), in connection with decisions relating to other areas and processes, in particular:

the distribution of dividends and, consequently, the choice between return and self-financing.

The members od BoD & shareholders, in fact, every year must decide whether to withdraw the profits from the company and reinvest them elsewhere or if keeping them in the company, avoiding the pursuit of money at banks or other lenders.

$$VAN = -C_0 + \frac{C_1}{1+i} + \frac{C_2}{(1+i)^2} + \cdots + \frac{C_n}{(1+i)^n}$$

2. the participation of other stakeholders in profits of the company (stock option plans, greater involvement of managers and employee share ownership).
3. evaluation of investment projects in tangible assets, facilities, and systems as well as intangible assets (research and development, training, etc.)
4. Evaluation of strategies.

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In the following years as finance begins to make use of increasingly sophisticated techniques, particularly statistics, to develop forecasts and decisions under uncertainty (portfolio theory and real options).

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It is difficult to find a definition and delimitation of the field of finance, although it may be considered that the financial function is the "place of useful skills-knowledge to the management of relations between the company and the capital market."

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In modern businesses, therefore, the roles and finance areas are:

1. finance as a support in the decisions;
2. Finance which technique for selecting the optimal capital structure;
3. Finance which time function for programming and control of financial flows;
4. finance for speculative cash flow management;
5. behavioral finance for the management of the systematic errors.

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1. The finance as a support in the decisions

In the first area, the decision-making, finance must be applied for include, for example, if a project can create value or to see if it would destroy.

From the point of view "business expert" (it does not take into account the intangibles and externalities):

the output value is referred to shareholders and is determined on the basis of the ability of a project to produce cash flows.

These flows have to be discounted (NPV calculation, or "net present value“ and calculation of the "cost of capital", defined as the discount factor necessary to discount the future cash flows of an investment project).

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In calculating the NPV, the *net present value* of the investments, we have to subtract the initial cost of implementation.

In the event that the resulting value (NPV), amounts to a sum **greater than zero, it may be considered that it has been created value**.

One increasing in shareholder wealth is being pursued through the implementation of investments that can produce higher yields and costs necessary to achieve them, as well as a yield on the specific business risk.

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The minimum required return corresponds to the opportunity cost of capital and in each project is necessary to compare the same with the business expected return (or facility to be evaluated).

About the definition of "minimum required return," it seems appropriate to imagine "tranquilizers cost that the employer should pay to quiet sleep."

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The difference between the yield on a risk-free investment (risk free, such as the one in government bonds, if the state is solvent, or one related to a bank account, if it is guaranteed the protection up to a certain amount) and a business subject to the rules and uncertain trends in the market, it is in the "**equity risk premium**", which an investor has to wait for the time of calculation of the minimum required profitability.

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2. Finance is a technique for selecting the optimal capital structure

It covers the sources of capital, which can support new investments.

The alternatives are many. It is usual to classify them based on the period for which these sources remain constrained within the enterprise as well as on account of remuneration arrangements and rights moving to head to the lenders.

We must continuously monitor the ratio of borrowed capital and equity capital (debt / equity ratio), in order not to overload the company of financial charges. They lead the company in conditions of instability and the risk of failure.

The manager may choose to:

A. Apply for funding by the shareholders. In this case it will be "equity", highlighted the financial statements in the net asset (share capital plus share premium reserves, future capital increase, etc.). Members can belong to several categories, classified according to the economic rights, and those of intervention in the management (ordinary shareholders, savings, privileged and "developing shareholder" means a hybrid made by Borsa Italiana (Stock Exchange) point to finance large listed companies).

B. You can also ask for external capital to finance the company through overdrafts on current accounts or the issue of bonds (listed or unlisted).

The company law reform of 2003 constitutes an element of innovation and help the financial structure of SMEs;
with it has been facilitated through the issuance of bonds.
it is not necessary to resort to the assembly (simply the resolution of the Board);

- the amount of bonds can be more than twice the share capital plus the legal reserves and all those available;
- you can issue subordinated bonds and variable return:
- repayment and the payment is subject to others' creditors and the payment of interest varies with the results of the company.

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In particular, even the limited company have the ability to issue bonds, without any quantitative limit.
But these securities may only be purchased by professional investors who meet the issuer's solvency.

To make it, company need to create a “portfolio of bonds” and bond issues concrete, to be placed with institutional investors in partnership with the ‘credit consortia' and industry associations.
Undertaking, by itself, is hardly able to achieve the emission.

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C. Seek to equity instruments.

It is a blended instruments assimilate the characteristics of the shares to those of bonds and, like bonds, give the right to repayment of the principal and interest payments.

In this case the refund is subordinated and the remuneration is variable depending on the results achieved by the company. As for some categories of actions, these tools give the right to participate, without vote, the Assembly, to appoint a member of B.o.D. and the Board of Auditors, to challenge the resolutions.

About the convenience for subscribers and for broadcasters:

for subscribers is granted participation to the economic results of the company, including through work contributions and services.

For the company: it is expanded the range of financing sources and you have debts on which interest is paid on the basis of profits made.

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These solutions are a solution to the input problem in the company of private equity funds; In fact, the funds involved in the management without being members (advantage for companies) and are guaranteed by a contract for the purposes of redemption and remuneration of the investment (advantage for the funds).

The remuneration represents a cost and, therefore, constitutes a deductible element.

The equity loans, for example, are medium and long-term loans granted by banks without collateral, but on condition that the company is committed to its recapitalization (50-100% of the loan) through the contribution of the members or reinvested profits

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An important aspect with implications on corporate social responsibility concerns the entry in the equity of private equity funds:

It will be necessary to evaluate the peculiarities of corporate governance prior to attracting new members, so that, once entered a new investor in the council and in the assembly, if this is driven by speculative motives, it should not overturn a negative management.

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In several cases the directors appointed by the private equity funds irresponsible lead to profit maximization in the short term, at the expense of relational goods and workers, and the company in the long run.

A management strategy, the lock-up clauses and agreements on the output of the bottom after a certain period of management must be carefully considered, in order to predict the effects and impact on the various stakeholders following the release of a major shareholder;

it is the company's viability in the production of value provided for all stakeholders and of the negative externalities that could occur.

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3 The finance for the planning and control of financial flows
4. The finance as a profit center

As part of the management and financial choices to be made in the ordinary management of the company, in addition to less frequent decisions on investment and on the calculation of their ability to create value (NPV), we encounter most commonly in the so-called matching of maturities or in the management of timing differences between receipts and payments in the short term.

It is customary to speak, in this regard, of short-term financial planning, time function to organize the dynamics of flows generated and absorbed over a relatively short period (minimum of 15 days to a maximum of 12 months), so as to establish the financial requirements and the manner of its coverage.

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A short-term financial statements is crucial to list all cash receipts and cash outflows of the period studied.

The income statement and the balance sheet, in fact, does not make clear the provisional amount of the bank and the liquidity in the cash account, it should therefore be a tool that can ensure the direction of being able to meet its payments at the end of each month.

Faced with revenue for invoices issued and not cashed, for example, we are in the balance sheet of a voice mail augmentative "credits", resulting in a balance sheet profit;

Appears quite clear that, if those claims are not received before the expiration of other debts that the company in the short term, such as the salaries of their workers or the bills of their suppliers, the entrepreneur in danger of bankruptcy (or bankruptcy Alternatively, as the courts, following an application by a creditor of the company that has not received the payment due).

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The typical representative index of short-term debt consists of net working capital, calculated as the difference between the gross working capital (cash in hand and bank and highly liquid securities, most receivables, plus inventories) and liabilities short-term (trade payables and short-term financial, no later than 12 months).

$$(L+C+S) > p$$

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Another liquidity ratio is given by a formula of the net working capital variant, in which you count the stock, often subject technological obsolescence.

$$L+C - p$$

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If the net working capital or dry liquidity ratio are positive (greater than zero), the organization may be considered in balance, although only after verifying that the deadlines and the collection of receivables precede the maturities of short-term liabilities.

Multi business enterprise you must also check the "product life cycle", since, according to the phase in which they are located (design, launch, maturity, decline) will experience a different drain on resources;

This, however, is highly predictable and still has to be managed carefully and responsibly. In case of need for short and very short-term financial sources, for example, the company is generally subject to high borrowing costs, which can jeopardize the whole business.

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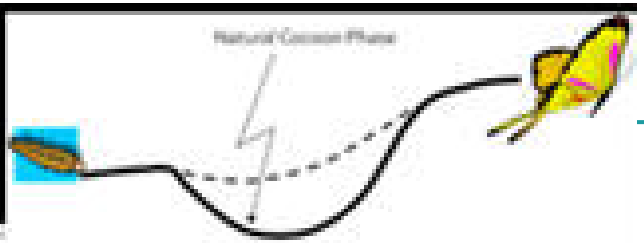
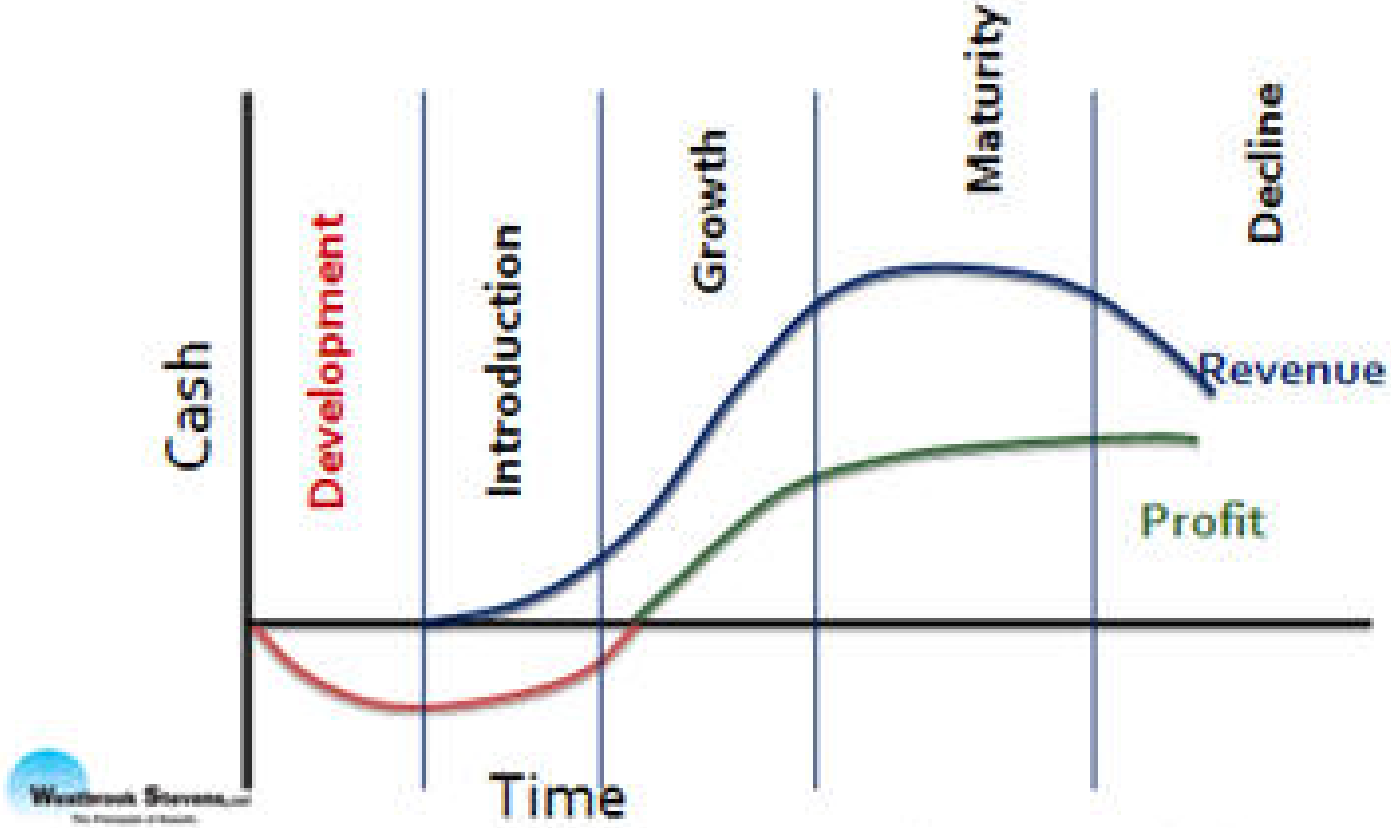
Product Lifecycle





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	Development	Introduction	Growth	Maturity	Decline
Product development and improvement costs	Extremely high	High	Low	Low	Zero
Marketing costs	Low	Very high	Medium	High	Low
Competition costs	Zero	Very low	Medium	High	Medium
Production cost per unit	Extremely high	High	Medium	Low	Very low
Total costs	Extremely high	Extremely high	Medium	Medium	Low

- In order to stabilize and make more predictable financial flows -in some cases highly aleatori- the manager can use hedging techniques specific for each sector, economic activity and type of capital structure. They may provide and ensure risks on commodity prices, on changes in interest rates or exchange rates, as well as on the prices of products to sell.
- One speaks in this case of "derivatives" in the sense that the value of the financial product is derived from the value of the underlying assets and they tied.

- The "**forward**" derivatives, for example, consist of agreements to establish rights to purchase or sell an asset at a specified time limit at some predetermined price. They serve, then, to block the delivery price. Derivatives "**futures**", similar to the "forward" are useful in blocking the piece of a specific well and you can also exchange on the stock markets.

- A third type of derivative consists of the "**put options**" and the "**call options**."
- The first type is used to entitle the investor to sell a certain asset at a certain date at a certain price. Symmetrically the "**call**" option to be a purchase option. The option allows you to make a choice, therefore, will be exercised if the expiration date will be convenient to do so.
- The "**swaps**", finally, are used to insure against changes in exchange rates or interest rates.

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- The question is closely linked to the fourth area of the finance function, finance as a profit center. It is increasingly common, in fact, the search for value creation including the provision of ancillary areas at the firm's core business. There is talk in this regard, the "financialization" of industrial enterprises. On the capital market, in fact, there may be opportunities that a manager with a certain amount of cash available can exploit, by means of:
- Speculation
- arbitrage.

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Behavioral finance

- The "behavioral finance" is to study the behavior of people posed in front of some economic and financial choices.

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- In the field of finance with the choices which confront constantly relate, for example, decisions on how much income to consume and how much to save; on provisions for future purposes or even no specific goals; or, in general, on how to generate money with the same money.
- These decisions are made by all individuals, sometimes unconsciously, sometimes resorting to an expert or, in other cases, drawing on personal knowledge and skills.

Need the intervention of psychologists just as economists do not have models that can render adequately into account the actual behavior of individual consumers / investors, but rather, seek to build ideal scenarios, certain assumptions data, constitute only good approximations of reality.

Individuals, in fact, think and decide under uncertainty, according to feelings and rational in different ways and -for certain aspects- more sophisticated than the classic models of the economy.

Once you accept this professional within a company, certain members felt that the psychologist should be taught only to control "the customer emotion.“

Certainly it is true that customers are emotional, but the emotions themselves are not wrong, although, unfortunately, are triggered by the thought processes sometimes inadequate.

There is talk in this regard, bias, systematic errors that savers (but also the consultants) can make under certain recurring situations.

Examples on the calculation of the NPV (= Net Present Value) and choice of an investment

-co = 100 (initial investment, year 0)
+ FC1 = 40 (year cash flow 1)
+ FC2 + 40 = (cash flow from year 2)
+ FC3 = 40 (year cash flow 3)
Discount rate "i" = 10%
Calculate the NPV and comment on the feasibility of the investment, depending on whether VAN is> = <zero

VAN = -Co + (40 / 1.1) + (40 / 1.12) + (40 + 1.13) = -100 + 99 = -1 (NEGATIVE!!!)

Commenting on the choice of the discount rate, which is calculated, at least, considering the risk-free rate + risk premium

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Sustainability & development

- 3 linked dimensions:

  - **economic**
  - **social**
  - **environmental**

- (ISO26000:2010)

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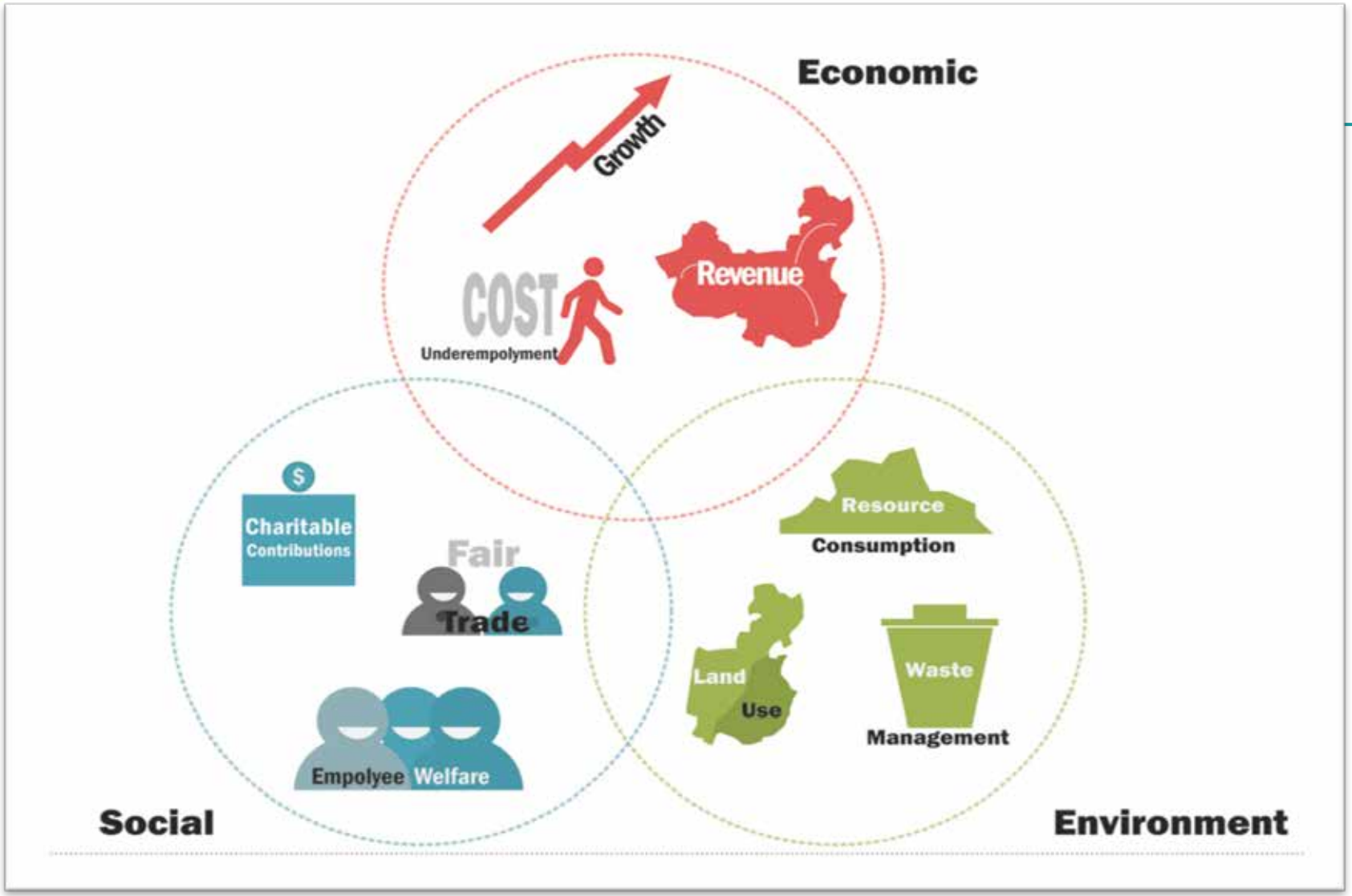

Definition of «CSR»

- *A renewed EU strategy 2011-14 for **Corporate Social Responsibility** (COM 2011/681*

*"The responsibility of entreprises for their **impact on society**"*

CSR: the responsibility of enterprises for their impact on society.
CSR should be company led. Public authorities can play a supporting role through a smart mix of voluntary policy measures and, where necessary, complementary regulation.

Companies can become socially responsible by integrating social, environmental, ethical, consumer, and human rights concerns into their business strategy and operations.

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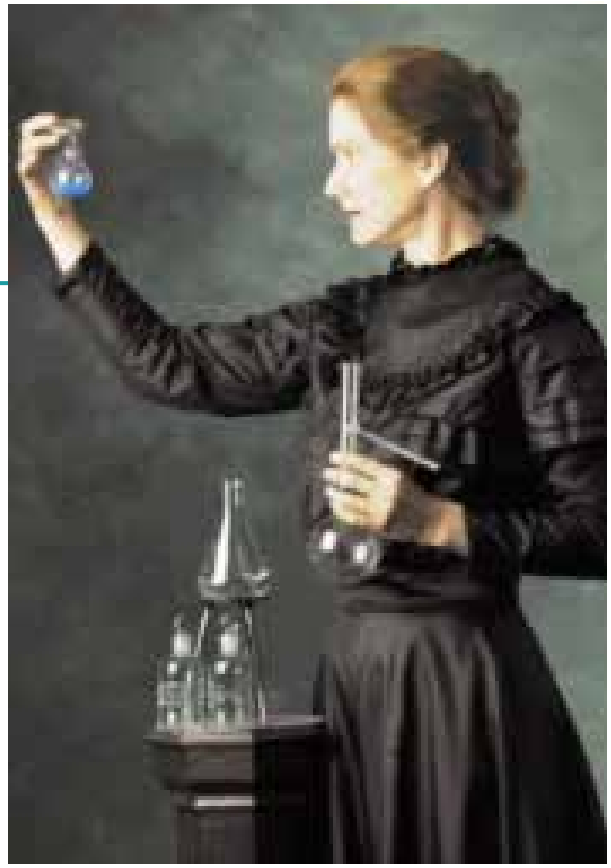
Impact &

Negative externalities

.. Positive externality



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From Global Compact... (pag. 6) to: Sustainable Development Goals

Standard

1. **certification AA1000SES**
2. **SA8000 new 201**5 with kpi annex
3. UNI ISO **26000 e** PdR 26000:2016; SR10.
4. **ISO 37001** anti brinery
5. ISO 31000, ISO 31010 (*risk management*)
6. **Global Compact** ONU
7. *ONU 17 sustainable dev. Goals 2030*
8. *Guiding Principles on Business and Human Rights (ILO ONU)*
9. **OECD Guidelines**
10. Global Reporting Initiative – **GRI -4**
11. **<IR> Integrated reporting**

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Steps:

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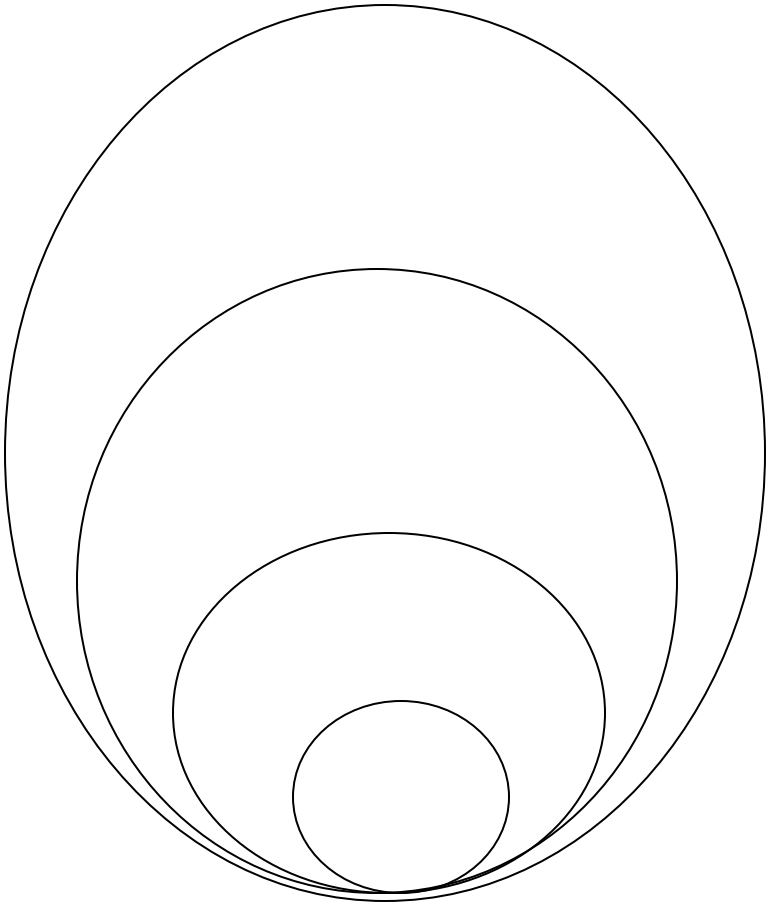
Map of «stakeholders»



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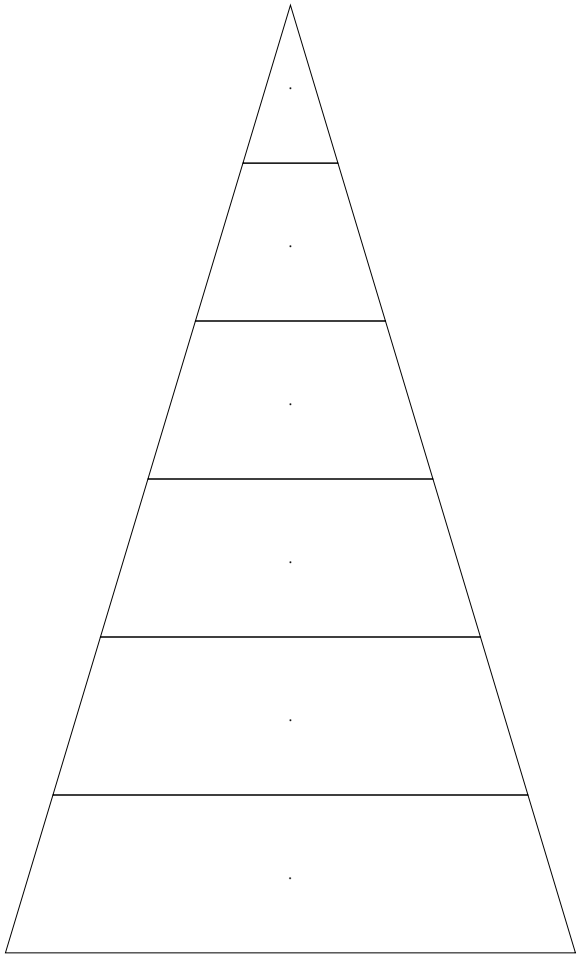
Evaluation of their strategic relevance



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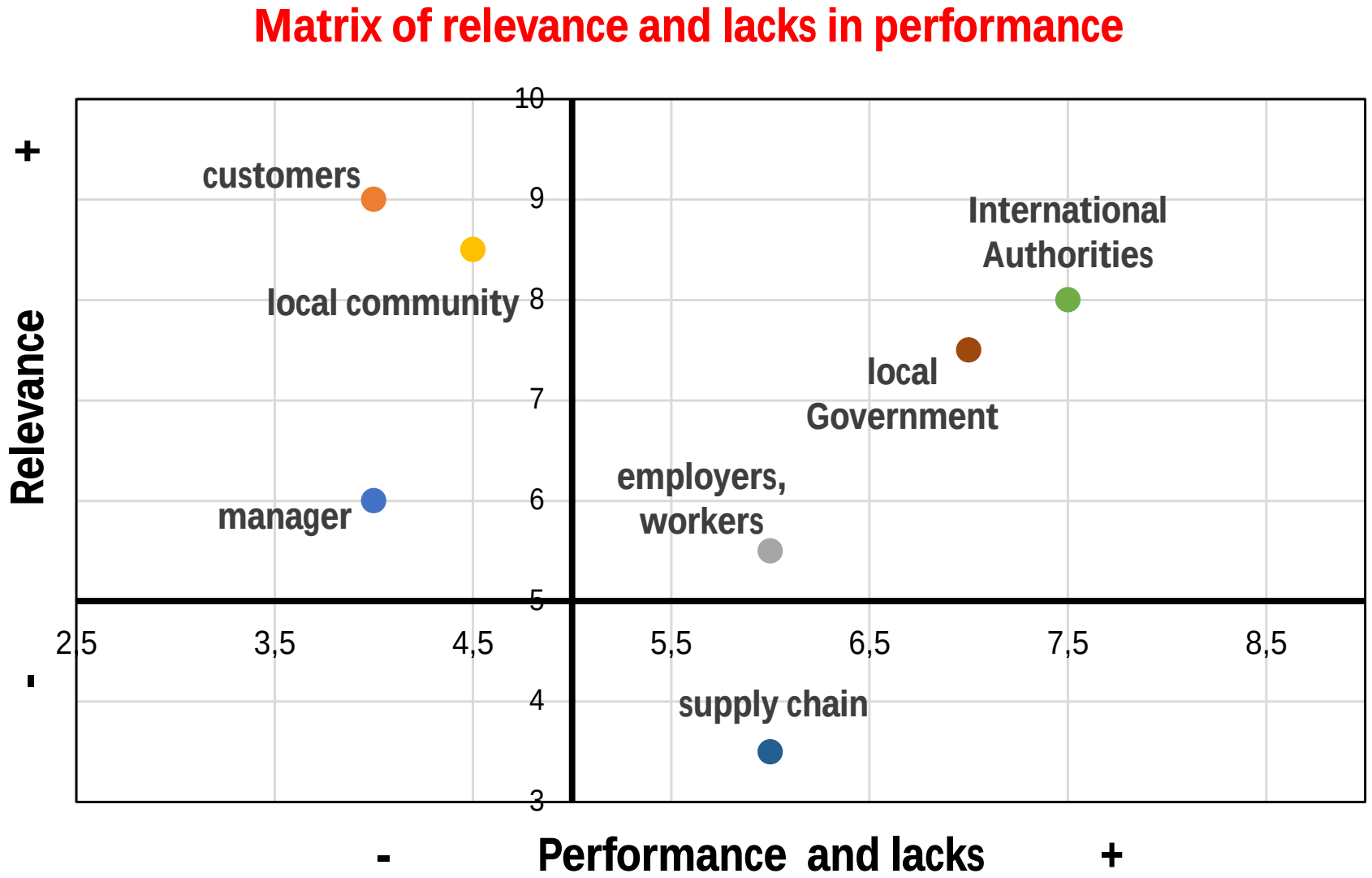
Evaluation of level of fitting answers to stakeholder needs

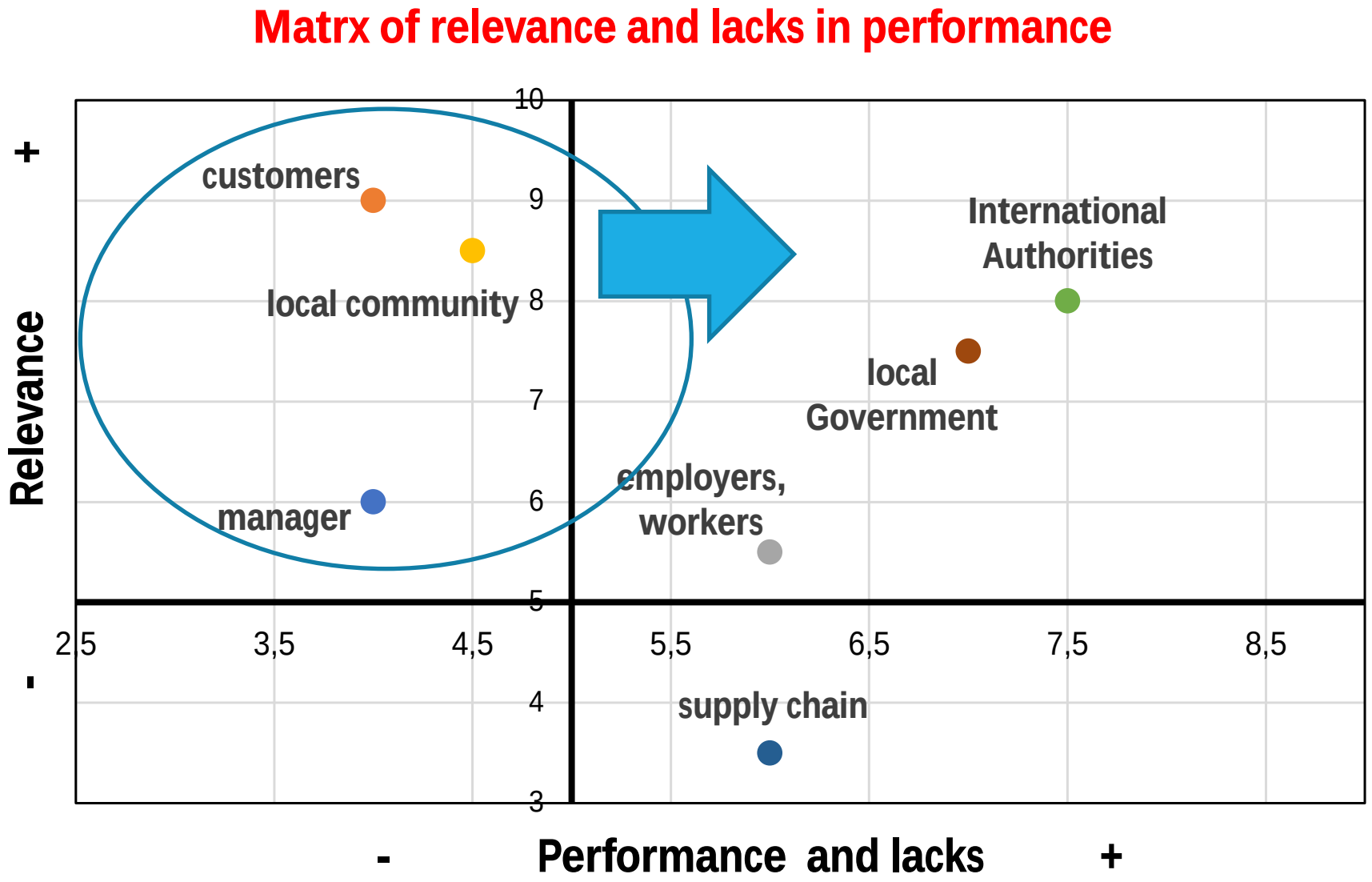
Likert scale from 1 to 5

- (1= **worst** answer to needs)
- (5= **best** answer to needs)

- Analysis related to **each** stakeholder

Actual position:




Matrx of relevance and lacks in performance
Relevance
+
-
10
9
8
7
6
5
4
3
customers
local community
manager
International Authorities
local Government
employers, workers
supply chain
2,5
3,5
4,5
5,5
6,5
7,5
8,5
-
Performance and lacks
+

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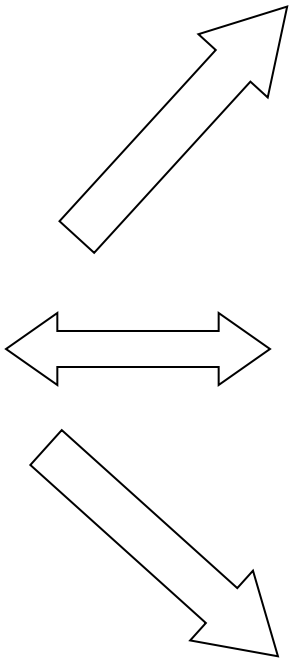
Strategy for each stakeholder

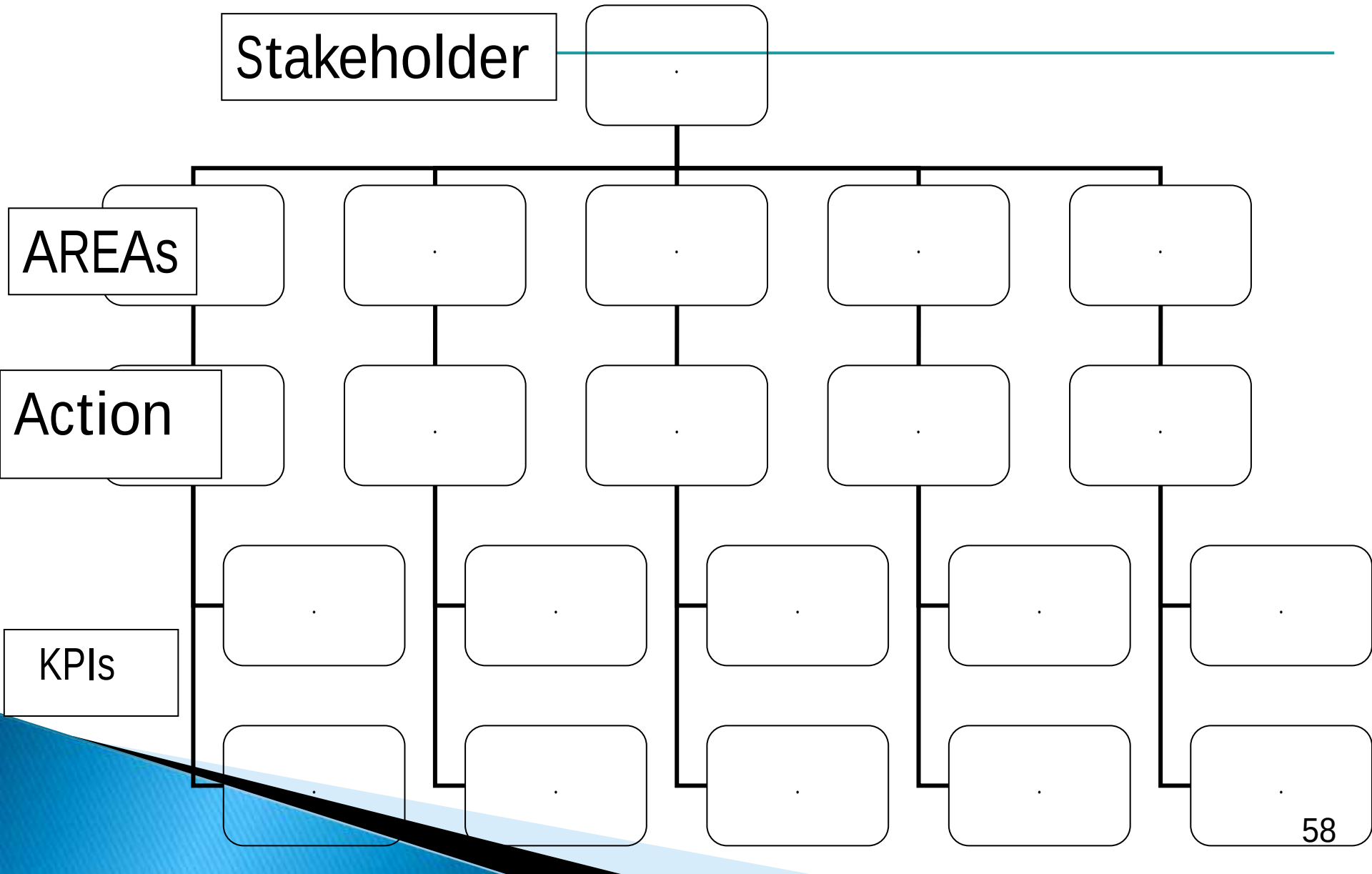


Grow

Mantain

Reduce

Fase 4 – The «strategic map»



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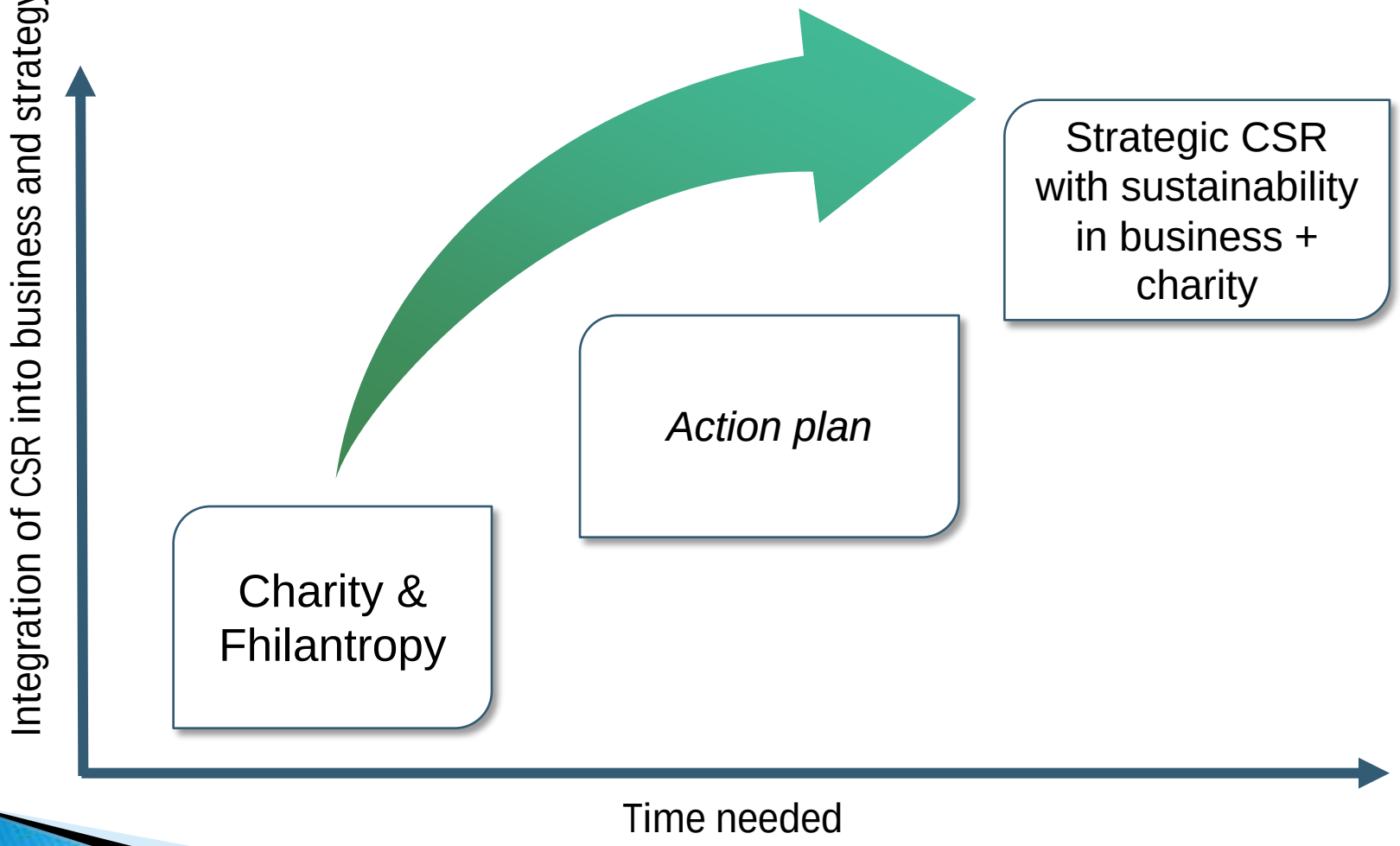
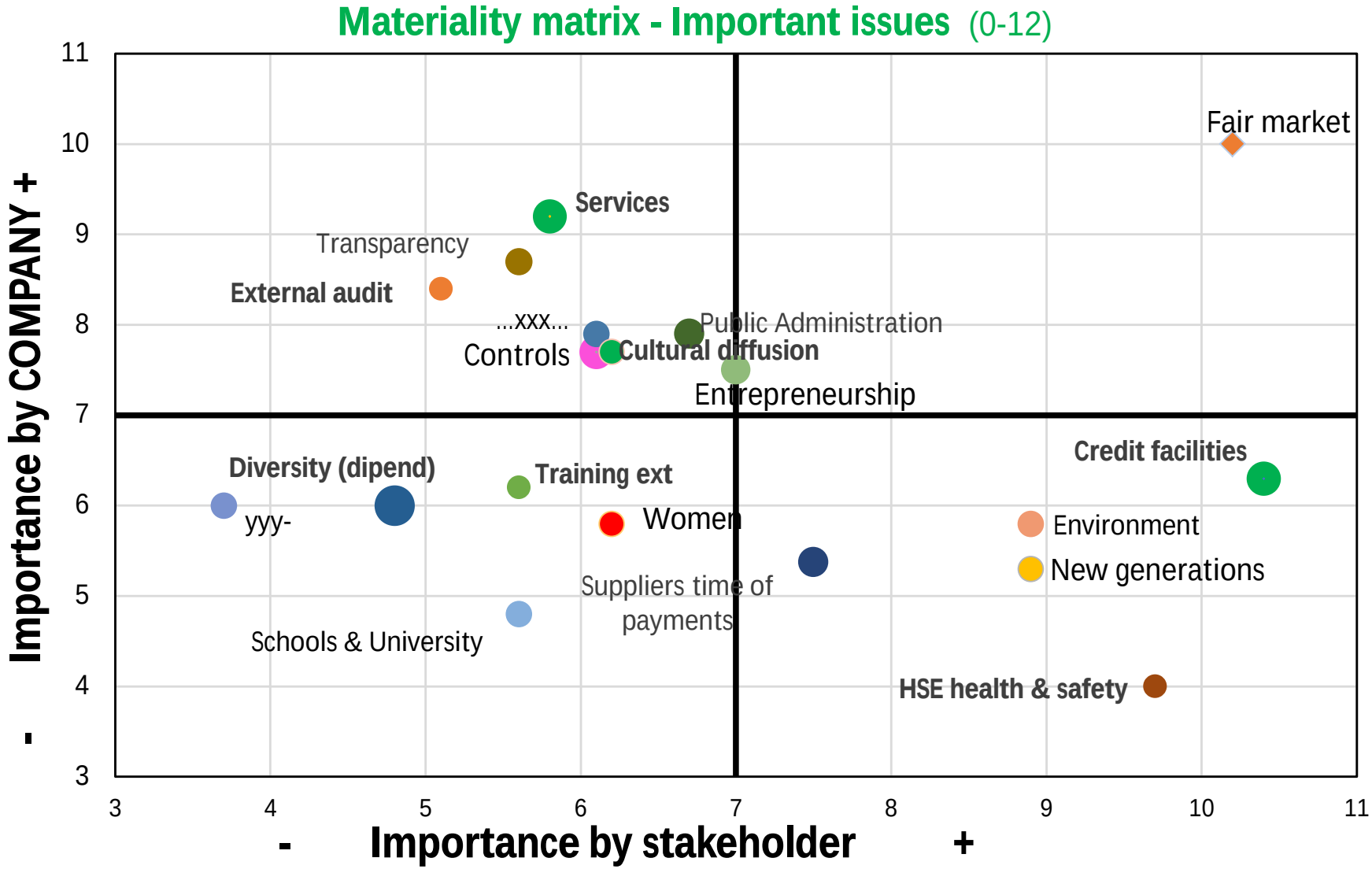
Analysis and BSC

Indicators (KPI)	Initial value	Target, aim	Benchmark (comparables)	Final value	Delta from target	Delta from benchmark	Analysis / next Objectives
internal meetings per month	2	3	4	3	ZERO	-1	...

sustainABILITY



Materiality matrix



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Investment Evaluation by Social ROI (S-ROI)

SROI - Social Effects of value chain activities

Each kind of organization (social enterprises ,not-for-profit entities) has an effect on economic, social and environmental aspects.

à Effects on employees, community, and environment.

Effects

Negative

(Social costs)

Positive

(Social benefits)

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Social Impact Assessment and Measurement

The measurement of Social Impact

quantifies and expresses social benefits in economic terms. The above-mentioned benefits are usually created by companies through their value chain activities.

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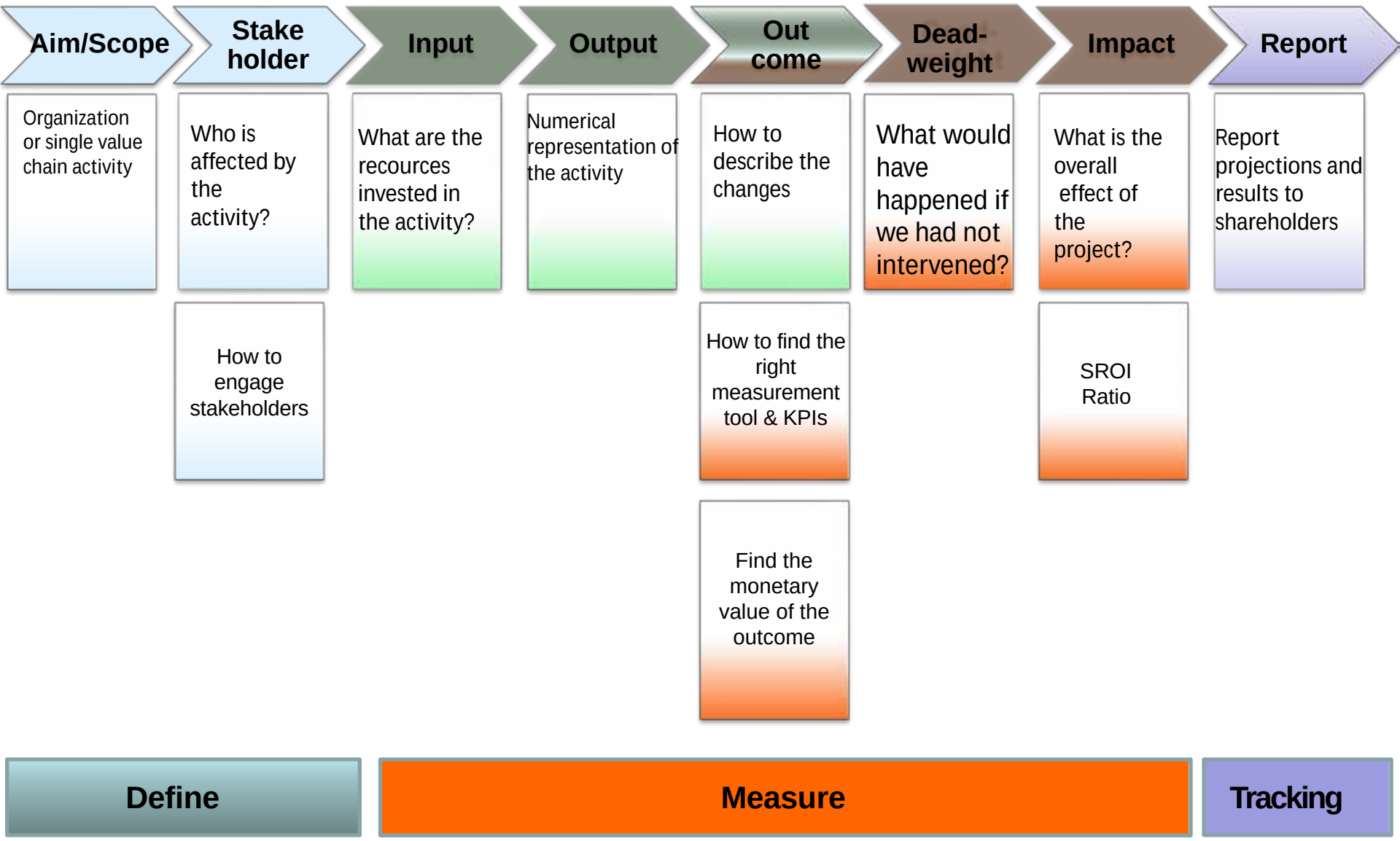
Social Return On Investment (SROI)

SROI is a measurement device based on analysis of social benefits and costs, through the map of impact and the comparison between:

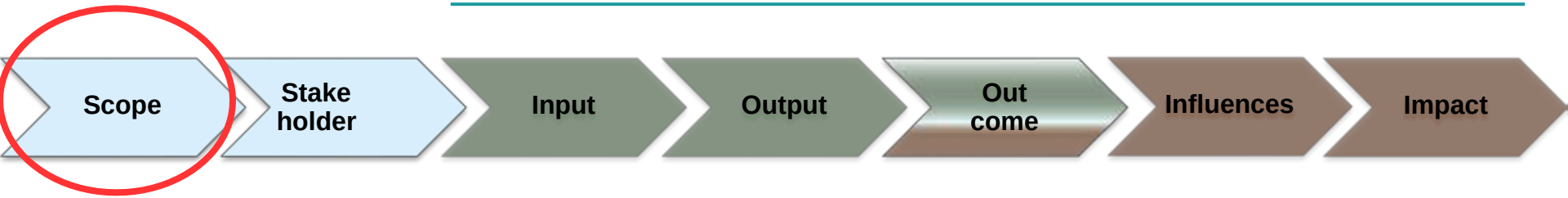
- The money value of all changes performed by the organization(outcome)
- The investment needed to achieve those changes.

This tool can be used in private , public and not-for-profit sectors

Map of Impact



Map of impact - Scope



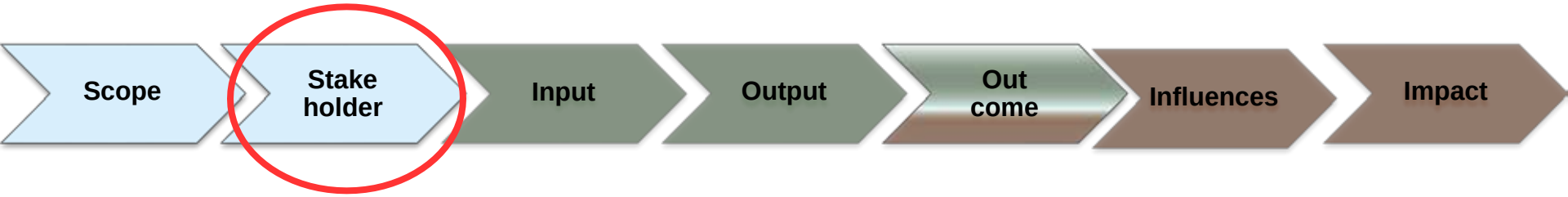
Before measuring the Social Impact, wee need to clarify our ideas about:

1. How Tasneef's customers are affected by its activities (Perimeter)
2. What are the social goals to be achieved (Social issue)
3. The scale of the social goal (Scale)

The impact map - Stakeholder

Who is affected by the activities?

People and organizations who/which beneft from the changes through the activity itself



Main Tasneef's stakeholders:

- Ship owners
- Government and PA
- Local communities, schools, neighbouhrood
- The international community
- employees
- suppliers

The impact map: Input

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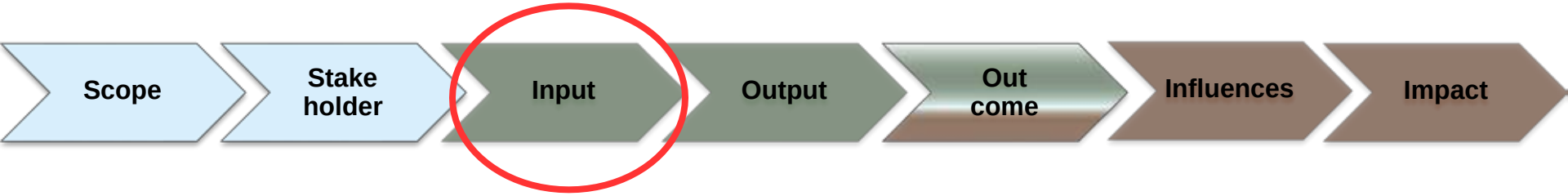
What are the resources invested?

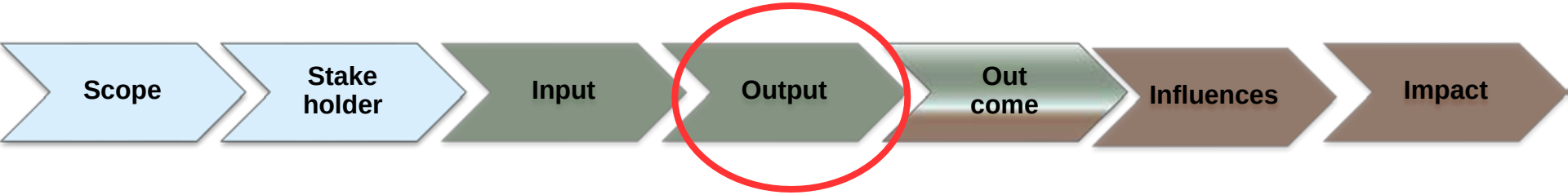


- Inputs have to be significant in size to be related to the impact
- Input relates to **the financial value of the overall invstment that is needed to carry out the activity** (operational and capital costs)
- It is fundamental to show the input/impact ratio to investors, shareholders and lenders.
- Investors/lenders **(Government, banks)** could fully provide this value or just a part of it

The impact map: Output

Quantitative description of the activity

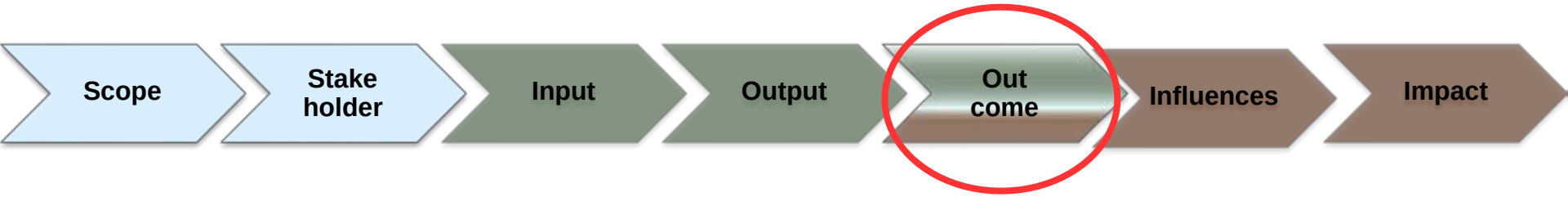
Outputs are direct consequences of the organization's activities



- number of registered ships
- Number of controlled ships
- Audit for Health Authority
- …
- …

The impact map: Outcome

How to describe changes?



Outcomes are changes that come out of the activity

Output

- Number of controlled ships

«Outcome»

- Decrease in accidents
- Reduction in irregularities
- Lower level of pollution, CO2 other environmental side effects
- Lower level of corruption
- Rise in employment rate
- Development of new technologies (innovation) and possibility to save time
- Training in primary schools
- charity events for local communities

Quantify the outcome: Indicators and valuation

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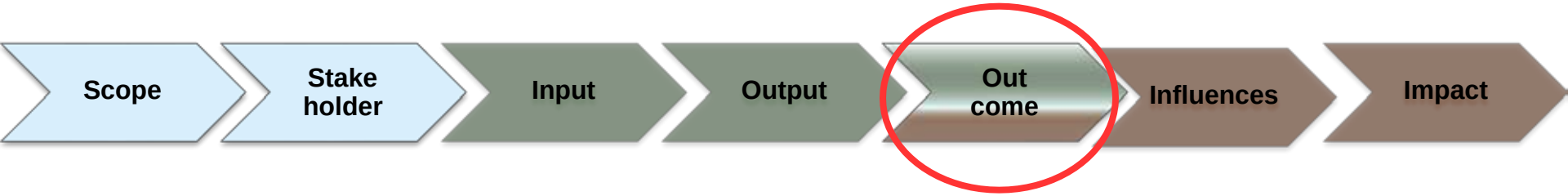
How to find the best-fitting measure?

Indicators are aimed at identifying and measuring all the benefits related to the changes.

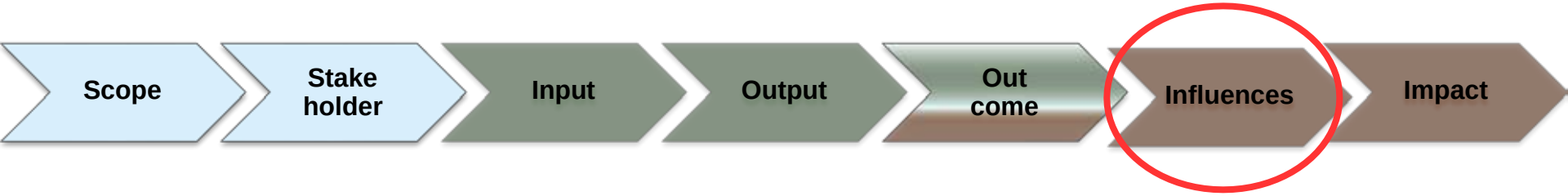


Indicators:

- Number of new employees
- Indirect benefits for workers' relatives and families
- Lower level of external supervision costs
- …

The impact map - influences

What is the overall impact of the activity?



Main influences are the following.

Deadweight: the percentage of the outcome that we would have obtained even if the activity had not been performed.

Attribution: the contribution in terms of change that was produced by other organizations or external factors

Displacement/social costs: valuation of negative effects that can be produced by activities

Deadweight/attribution

What would have happened if we had not intervened?

It is the measurement of the part of the outcome that:

- would have been obtained even without the activity
- Is caused by other people's/organizations' contribution

Outcome	Deadweight/attribution
Number of new employess	How many of them would have found an equivalent solution?

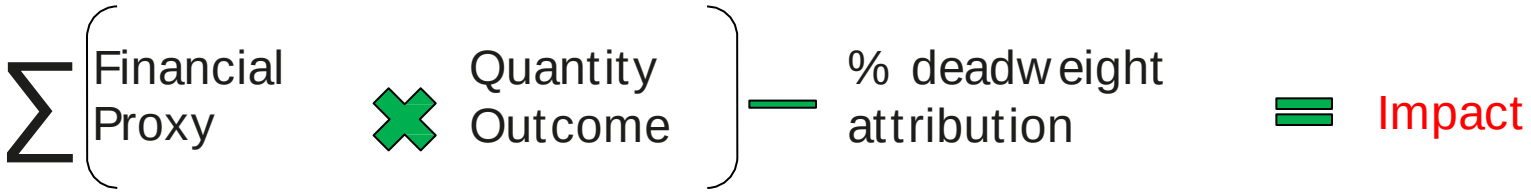
The stronger the effect of influences, the weaker the effect of the outcome

The impact map: impact

The impact is the numerical representation of the added value provided by the activity, namely the difference between the outcome value and all the influences.

In order to calculate the impact, follow the steps:

1. Multiply the financial proxy by the quantity outcome to obtain the **outcome value**
2. Ripete the step 1 for each outcome and add them up
3. Subtract the influences percentage



Impact map: SROI ratio

$$\text{SROI ratio} = \frac{\text{Impact}}{\text{Value of Inputs}}$$

- ü **A ratio is easier to understand**
- ü The social impact virtually «enlarge» the budget available

“each DIRHAM invested in Tasneef produces a social benefit whose value falls between 4 and 6 DIRHAM”

Principles of SROI (1)

1. **Knowledge of what changes**
   - § Positive / Negative
   - § Explicit / Tacit
2. **Stakeholder engagement**
   - § What should be measured
   - § How to measure and evaluate
3. **Materiality**

   Focus on important and relevant features only
4. **Valuation**

   Try to use indirect costs, or otherwise financial proxy

Principles of SROI (2)

5. **Be fair**

   § Refer to trends e benchmarks to identify the trend caused by the activity

   § Take into account what would have happened if we had not intervened

   § Take into account other people's/organizations' contribution

6. **Be transparent:**

   Sources and methodology of information collection must be rigorous and supported by facts/numbers

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Investment decisions & other methodologies

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The Accept/Reject Decision

methods:

- Payback Period
  - years to recoup the initial investment
- Net Present Value (NPV)
  - change in value of firm if project is under taken
- Internal Rate of Return (IRR)
  - projected percent rate of return project will earn
- Modified Internal Rate of Return (MIRR)

- Consider Projects A and B that have the following expected cashflows?

	PROJECT	
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

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- What is the payback for Project A?

PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

- What is the payback for Project A?

PROJECT		
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

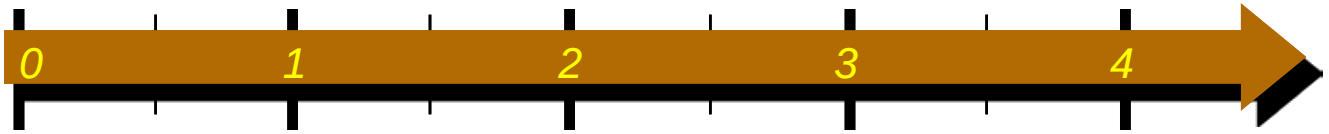
(10,000)	3,500	3,500	3,500	3,500
Cumulative CF	-6,500	-3,000	+500	

- What is the payback for Project A?

P R O J E C T

Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

Payback in 2.9 years



(10,000)	3,500	3,500	3,500	3,500
Cumulative CF	-6,500	-3,000	+500	

- What is the payback for Project B?

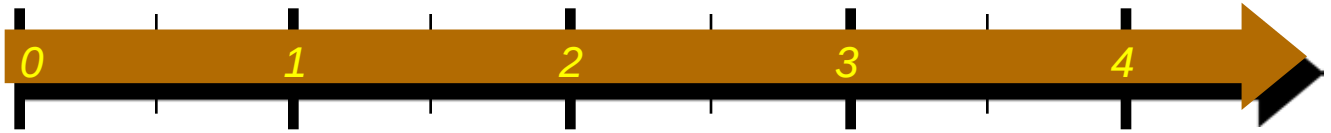
PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

(10,000) 500 500 4,600 10,000

- What is the payback for Project B?

PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

Payback in 3.4 years



(10,000)	500	500	4,600	10,000
Cumulative CF	-9,500	-9,000	-4,400	+5,600

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Payback Decision Rule

- Accept project if payback is less than the company's predetermined maximum.
- If company has determined that it requires payback in three years or less, then you would:
  - accept Project A
  - reject Project B

Net Present Value NPV

- Present Value of all costs and benefits (measured in terms of incremental cash flows) of a project.
- Concept is similar to Discounted Cashflow model for valuing securities but subtracts the cost of the project.

Net Present Value

- Present Value of all costs and benefits (measured in terms of incremental cash flows) of a project.
- Concept is similar to Discounted Cashflow model for valuing securities but subtracts of cost of project.

NPV = PV of Inflows - Initial Investment

$$NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots \frac{CF_n}{(1+k)^n} - \text{Initial Investment}$$

What is the NPV for Project B?

PROJECT		
Time	A	B
0	(10,000)	(10,000)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

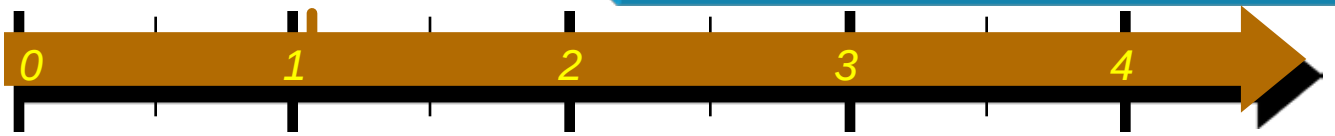
k=10%

(10,000) 500 500 4,600 10,000

What is the NPV for Project B?

PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

k=10%



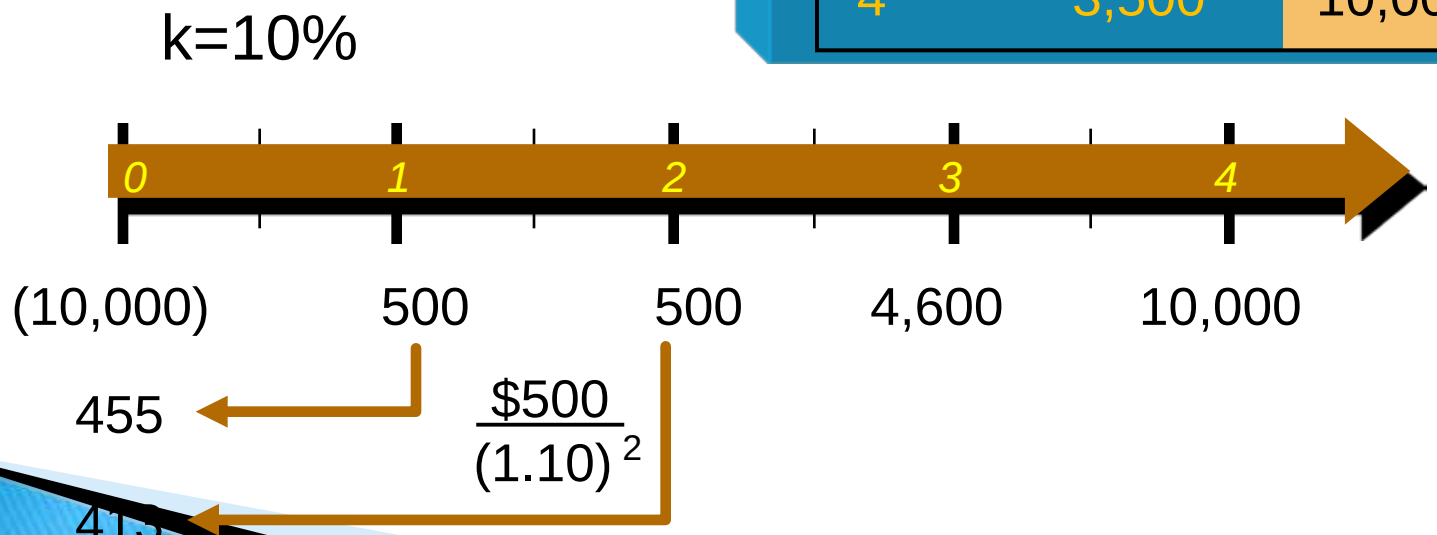
(10,000) 500 500 4,600 10,000

455

$$\frac{\$500}{(1.10)^1}$$

What is the NPV for Project B?

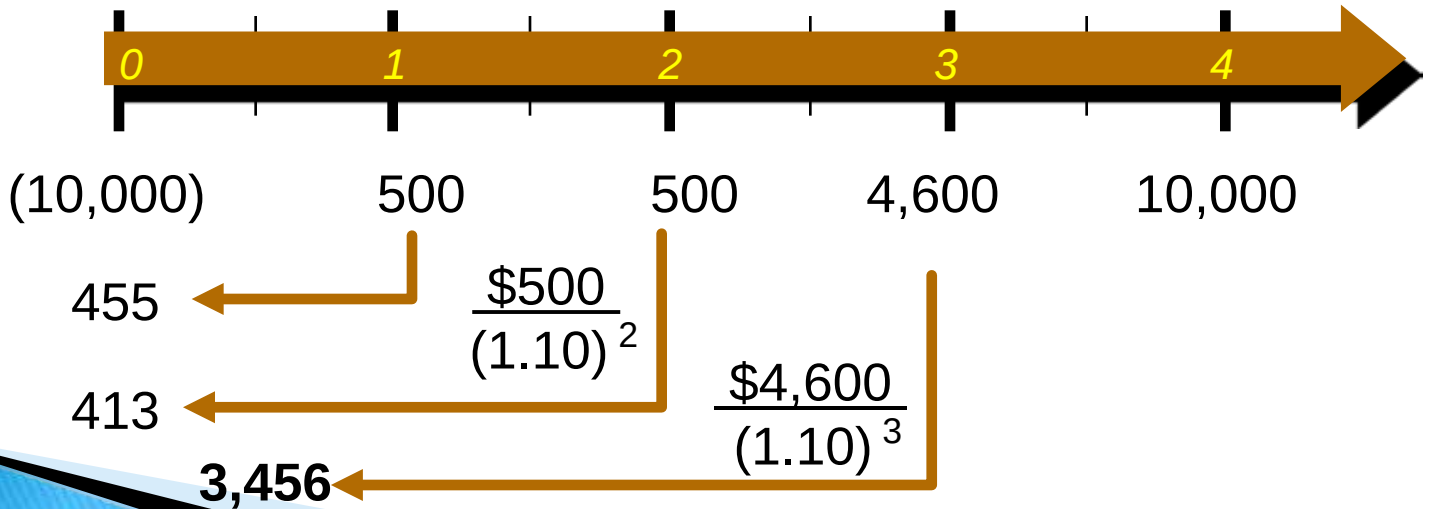
PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000



What is the NPV for Project B?

k=10%

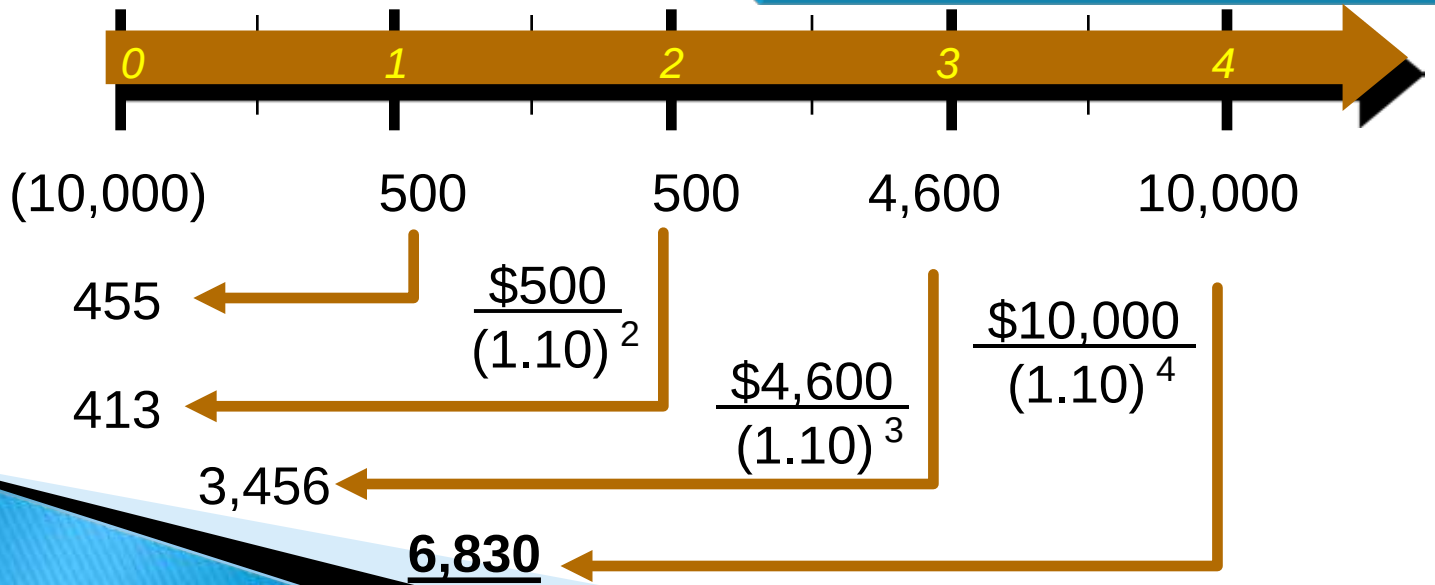
PROJECT		
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000



What is the NPV for Project B?

k=10%

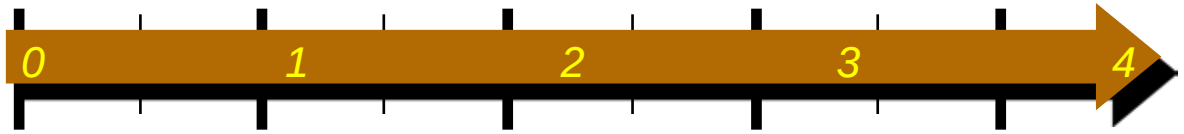
PROJECT		
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000



What is the NPV for Project B?

PROJECT		
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

k=10%



(10,000) 500 500 4,600 10,000

455

413

3,456

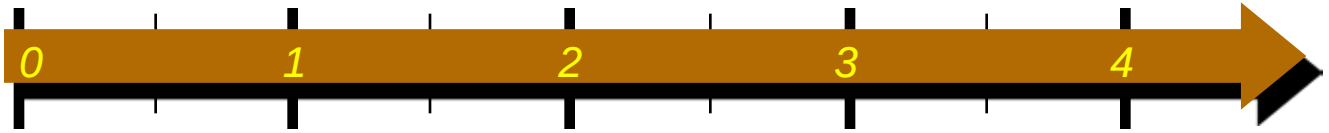
6,830

$11,154

What is the NPV for Project B?

k=10%

PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000



(10,000) 500 500 4,600 10,000

455

413

3,456

6,830

$11,154

PV Benefits > PV Costs
$11,154 > $ 10,000

What is the NPV for Project B?

PROJECT

Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

k=10%

(10,000) 500 500 4,600 10,000

455

413

3,456

6,830

PV Benefits > PV Costs
$11,154 > $ 10,000

NPV > $0
$1,154 > $0

$11,154 - $10,000 = $1,154 = NPV

NPV Decision Rule

- Accept the project if the NPV is greater than or equal to 0.

Example:

NPV_A = \$1,095 **> 0** **Accept**

NPV_B = \$1,154 **> 0** **Accept**

- If projects are independent, accept both projects.
- If projects are mutually exclusive, accept the project with the higher NPV.

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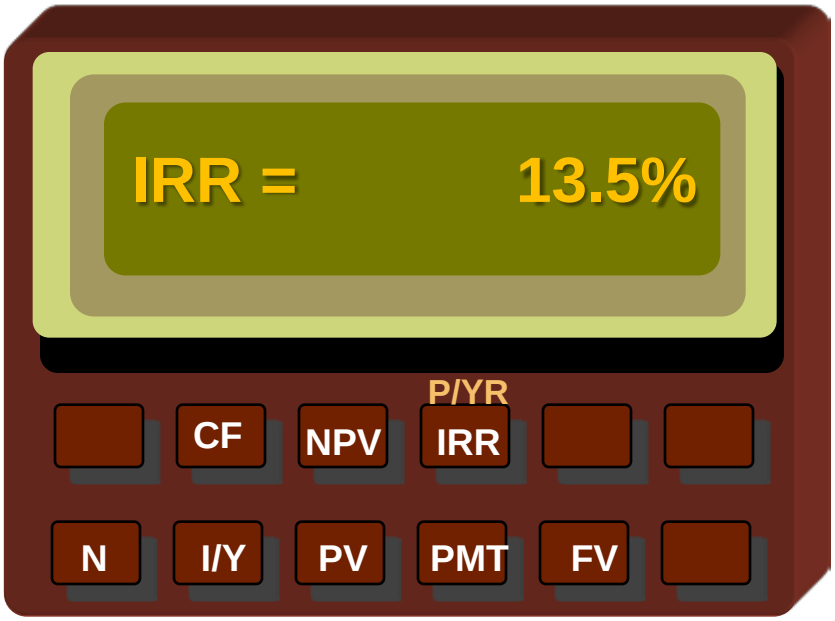
IRR

- IRR (Internal Rate of Return)
  - IRR is the discount rate that forces the NPV to equal zero.
  - It is the rate of return on the project given its initial investment and future cash flows.
    - The IRR is the rate earned only if all CFs are reinvested at the IRR rate.

Calculate the IRR for Project B with calculator.

PROJECT		
Time	*A*	*B*
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

Calculate the IRR for Project B with calculator.



P R O J E C T

Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

Enter CFs as for NPV

IRR CPT

- Accept the project if the IRR is greater than or equal to the required rate of return (k).
- Reject the project if the IRR is less than the required rate of return (k).

Example:

k = 10%

IRR_A = 14.96%	**> 10%**	**Accept**
IRR_B = 13.50%	**> 10%**	**Accept**

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Capital Budgeting Methods

- MIRR (Modified Internal Rate of Return)
  - This is the discount rate which causes the project's PV of the outflows to equal the project's TV (terminal value) of the inflows.

$$PV_{outflow} = \frac{TV_{inflows}}{(1 + MIRR)^n}$$

  - Assumes cash inflows are reinvested at k, the safe re-investment rate.
  - MIRR avoids the problem of multiple IRRs.
  - We accept if MIRR $\geq$ the required rate of return.

What is the MIRR for Project B?

PROJECT		
Time	A	B
0	(10,000.)	(10,000.)
1	3,500	500
2	3,500	500
3	3,500	4,600
4	3,500	10,000

Safe =2%

(10,000) 500 500 4,600 10,000

(10,000)/(1.02)^0 500(1.02)^3 500(1.02)^2 4,600(1.02)^1 10,000(1.02)^0

10,000

4,692

520

531

15,743

(10,000)

$$10{,}000 = \frac{15{,}743}{(1 + \text{MIRR})^4}$$

MIRR = .12 = 12%

Calculate the MIRR for Project B with calculator.

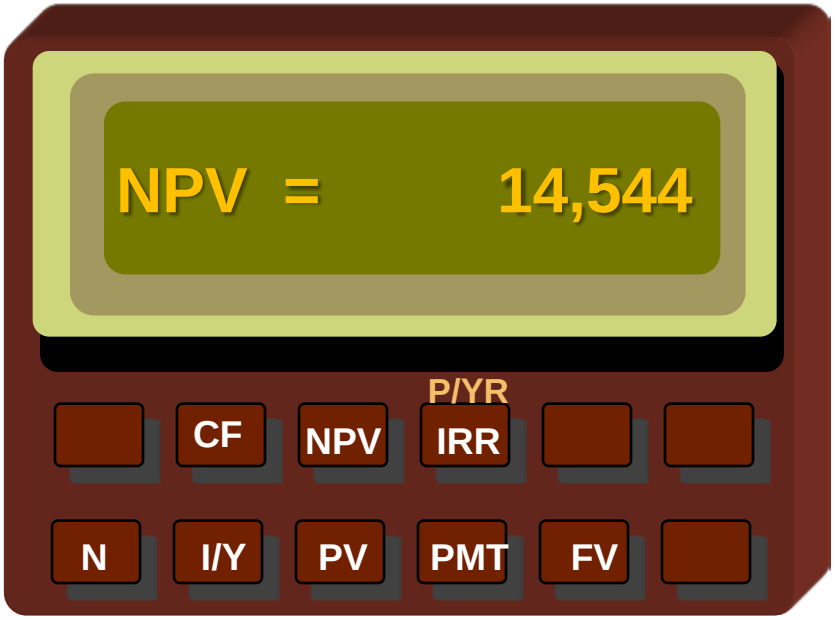
Step 1. Calculate NPV using cash inflows

Keystrokes for TI BAII PLUS:

CF	0	+/-	ENTER
↓	500		ENTER
↓	2		ENTER
↓	4600		ENTER
↓	1		ENTER
↓	10000		ENTER
↓	1		ENTER

Calculate the MIRR for Project B with calculator.

Step 1. Calculate NPV using cash inflows



Keystrokes for TI BAII PLUS:

NPV	2	ENTER
↓	CPT	

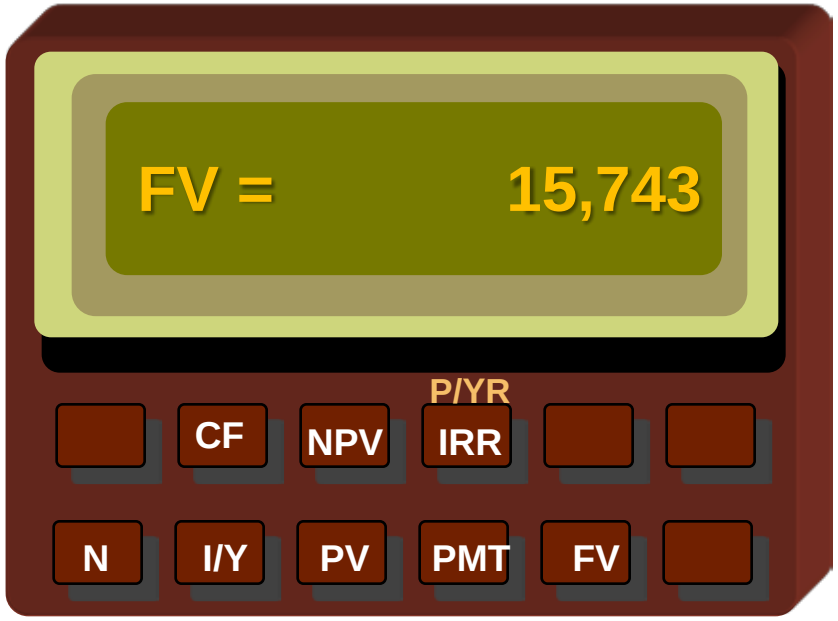
The net present value of Project B cash inflows = $14,544 (use as PV)

Calculate the MIRR for Project B with calculator.

Step 2. Calculate FV of cash inflows using previous NPV
This is the Terminal Value

Calculator Enter:

N = 4
I/YR = 2
PV = -14544
PMT = 0
CPT FV = ?



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Calculate the MIRR for Project B with calculator.

Step 3. Calculate MIRR using PV of outflows and calculated Terminal Value.

Calculator Enter:

N = 4
PV = -10000
PMT = 0
FV = 15,743
CPT I/YR = ??

- Capital Budgeting Decision
  - Central to the success of any company is the **investment decision**, also known as the **capital budgeting decision**.
  - Assets acquired as a result of the capital budgeting decision can determine the success of the business for many years.
  - It is extremely important that we ensure that the correct capital budgeting decision is made!

Other Investment Criteria

- Internal Rate of Return (IRR)
  - IRR is simply the discount rate at which the NPV of the project equals zero.

$$NPV = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \ldots + \frac{C_n}{(1+r)^n} = 0$$

  - You can calculate the rate of return on a project by:
    1. Setting the NPV of the project to zero.
    2. Solving for "r".
  - Unless you have a financial calculator, this calculation must be done by using trial and error!

- Internal Rate of Return (IRR)
  - To go back to our office example, we discovered the following:

Discount Rate	NPV of Project
7%	$23,382
12%	$7,143

At what rate of return will the NPV of this project be equal to zero?

- Internal Rate of Return (IRR)
  - If we solve for "r" in the equation below, we find the IRR for this project is 14.29%:

$$NPV = -\$350{,}000 + \frac{\$400{,}000}{1+r} = 0$$

$$r = 14.29\%$$

- IRR Decision Rule: Accept Projects with IRR which exceeds the opportunity cost of capital

- Internal Rate of Return (IRR)
  - Another way of solving for IRR is to graph the NPV at various discount rates.
  - The point where this NPV profile crosses the “x” axis will be the IRR for the project.

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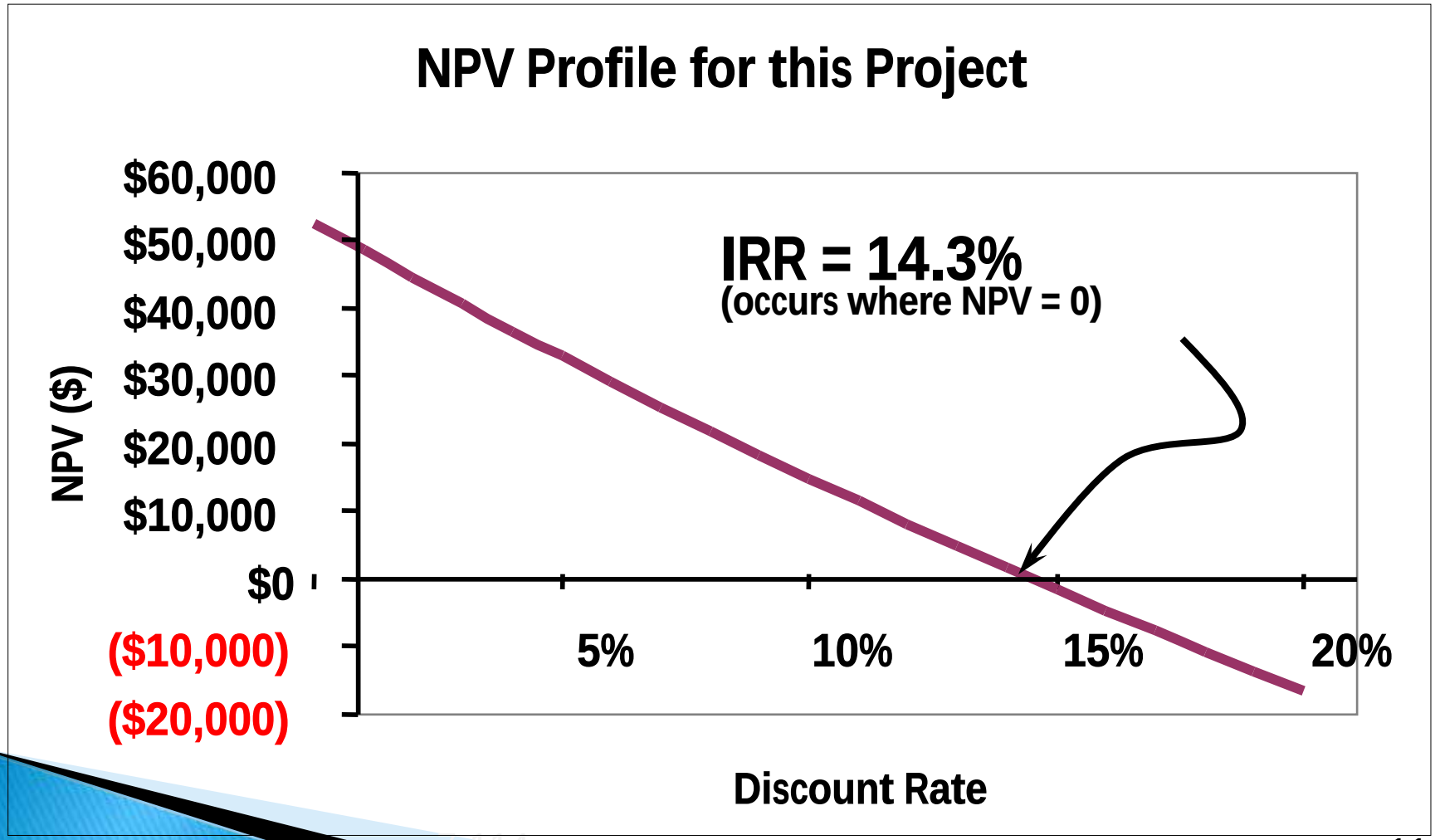
IRR BY GRAPH



Other Investment Criteria

- Internal Rate of Return (IRR) vs NPV:
  - **The NPV Rule** states that you invest in any project which has a positive NPV when its cash flows are discounted at the opportunity cost of capital.
  - **The Rate of Return Rule** states that you invest in any project offering a rate of return which exceeds the opportunity cost of capital.
    - i.e., if you can earn more on a project than it costs to undertake, then you should accept it!
  - The NPV and IRR rules will give the same accept/reject answer about a project as long as the NPV of a project declines smoothly as the discount rate increases.
  - Do not confuse IRR and the opportunity cost of capital

Other Investment Criteria

- Payback vs NPV … what to do?
  - Payback gives the same weight to all CFs which occur before the cutoff period, while it completely ignores the CFs after the cutoff
    - The firm decision will be biased towards too many short term lived projects
    - And against some long-lived projects.
  - NPV gives the correct answer:
    - Only project A will increase shareholder value.
    - Therefore, it should be the only project accepted.
  - Lesson:
  - **Use NPV if you want to make the correct investment decision!**

Other Investment Criteria

- Discounted Payback
  - Discounted payback is the time period it takes for the **discounted** cash flows generated by the project to cover the initial investment in the project.
    - It offers an important advantage over Payback: if a project is acceptable with the Discounted Payback, it must have a positive NPV (if the ignored Cashflows are all positive!)
  - Although better than payback, it still ignores all cash flows after an arbitrary cutoff date.
    - Therefore it will reject some positive NPV projects.
  - NPV is thus always preferable to discounted payback in evaluating projects!

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Summary of Chapter 6

- NPV is the only measure which always gives the correct decision when evaluating projects.
- The other measures can mislead you into making poor decisions if used alone.
- The other measures are:
  - IRR
  - Payback

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End of presentation

- Any questions?

- Thank you

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Ref. and contacts

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DI GENOVA